

REMARKS

Overview of the Office Action

Claim 2 has been objected to for an informality.

Claims 1, 6-8, and 11-15 have been rejected under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,724,792 (“Rice”).

Claims 2-5 and 9-10 have been rejected under 35 U.S.C. §103(a) as unpatentable over Rice

Status of the claims

Claims 1 and 14 have been amended.

Claim 2 has been canceled.

Claims 1-15 remain pending.

Objections to claim 2

The Office Action states that claim 2 includes the word “for”, which is superfluous. Claim 2 has been canceled, which renders this objection moot.

Rejection of 1, 6-8, and 11-15 under 35 U.S.C. §102(e)

The Office Action states that Rice teaches all of Applicants’ recited elements. Applicants’ disagree.

Independent claim 1 has been amended to recite a device, “wherein the thermal time constant τ is matched to the pulse duration D so that the thermal time constant τ is greater than

half the pulse duration D in order to reduce the amplitude of the temperature changes”, which Rice fails to teach or suggest. Support for the claim amendment can be found in original claim 2.

According to Applicants’ recited invention, the amplitude of the temperature change ΔT of the semiconductor laser is reduced by matching the thermal time constant τ to the pulse duration D. This means that Applicants’ recited device reduces the transient heating during the duration of one laser pulse. As indicated in paragraph [0016] of the published version of the present application, the smaller temperature changes per each pulse take place at a higher temperature than larger changes at comparatively lower temperatures.

Rice discloses a semiconductor laser device 18, which operates in pulse mode, and includes a plurality of laser diode bars 31. Each laser diode bar 31 includes a laser diode array 19 disposed between heat sinks 30 (see Fig. 2, col. 5, lines 61-65, and col. 6, lines 53-62 of Rice).

The Examiner states that, in view of Rice, it would have been obvious to one skilled in the art to choose a material type of the optoelectronic device such that the recited relationships hold true in order to use materials of varying frequency output regimes. Applicants disagree.

According to Rice, the semiconductor laser device is cooled in order to maintain the semiconductor laser device at a temperature safely below a predetermined maximum temperature (see col. 9, lines 2-6 of Rice). To achieve this goal, the laser diode assembly of Rice may be cooled in any manner known to those skilled in the art (see col. 9, lines 6-8 of Rice). In particular, Rice discusses immersion cooling (i.e., circulating liquid coolant around the semiconductor laser device) as a preferred means to cool the semiconductor laser device.

Typically, when cooling a semiconductor laser device, an attempt is made to minimize the maximum value of the temperature increase (ΔT), where $\Delta T(t)$ (change in temperature as a

function of time) would converge for t approaching infinity, in order to keep the maximum temperature of the component as low as possible (see paragraphs [0005] and [0006] of the published version of Applicants' specification (US 2007/0160097)).

Consequently, this means that Rice teaches reducing the mean temperature of the semiconductor device during operation (i.e., mean cooling). Rice does not teach or suggest reducing the transient heating or the amplitude of the temperature change during the duration of one pulse.

Contrary to the Examiner's assertion, the teachings of Rice would not motivate a person skilled in the art to increase the thermal time constant τ to values greater than half the pulse duration D because an increase of the thermal time constant τ results in an increase of the final temperature of the optoelectronic device (see paragraph [0016] of Applicants' specification), which is contrary to the goal of Rice, which is to decrease the temperature of the semiconductor device.

The above effect occurs because, with an increase of the thermal time constant τ , there is, in fact, a slowed increase of the temperature of the semiconductor device during one pulse (i.e., a smaller ΔT). However, also occurring with an increased time constant τ , is a smaller decrease of the temperature of the semiconductor device (i.e., less heat dissipation) between two pulses. Consequently, the temperature of the semiconductor device cannot decrease to the original temperature during the time between two pulses (i.e., cooling time) with a thermal time constant τ as recited in Applicants' claim 1. Thus, over time, Applicants' semiconductor device retains more heat, but has a lower change in temperature (i.e., a smaller ΔT) from pulse to pulse. Nothing is taught or suggested in Rice would motivate one skilled in the art to pursue such an above-described effect.

Therefore, Rice clearly fails to teach or suggest “wherein the thermal time constant τ is matched to the pulse duration D so that the thermal time constant τ is greater than half the pulse duration D in order to reduce the amplitude of the temperature changes”, as recited in Applicants’ amended claim 1.

Claim 14 has been amended to recite limitations similar to claim 1 and is, therefore, deemed to be patentably distinct over Rice for at least those reasons discussed above with respect to independent claim 1.

In view of the foregoing, it is respectfully submitted that Rice fails to teach or suggest the subject matter recited in Applicants’ independent claims 1 and 14. Accordingly, claims 1 and 14 are patentable over Rice under 35 U.S.C. §102(e).

Dependent claims

Claims 6-8, 11-13, and 15, which depend from independent claims 1 and 14, incorporate all of the limitations of the respective independent claim and are, therefore, deemed to be patentably distinct over Rice for at least those reasons discussed above with respect to independent claims 1 and 14.

Rejection of claims 2-5 and 9-10 under 35 U.S.C. §103(a)

The Office Action states that the combination of Rice teaches all of Applicants’ recited elements.

As previously discussed, Rice does not teach or suggest the invention recited in Applicants’ independent claim 1.

Claims 2-5 and 9-10, which depend from independent claim 1, incorporate all of the limitations of independent claim 1 and are, therefore, deemed to be patentably distinct over Rice for at least those reasons discussed above with respect to independent claim 1.

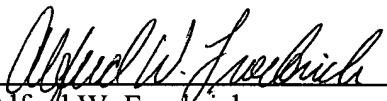
Conclusion

In view of the foregoing, reconsideration and withdrawal of all rejections, and allowance of all pending claims is respectfully solicited.

Should the Examiner have any comments, questions, suggestions, or objections, the Examiner is respectfully requested to telephone the undersigned in order to facilitate reaching a resolution of any outstanding issues.

It is believed that no fees or charges are currently due. However, if any fees or charges are required at this time in connection with the application, they may be charged to our Patent and Trademark Office Deposit Account No. 03-2412.

Respectfully submitted,
COHEN PONTANI LIEBERMAN & PAVANE LLP

By 
Alfred W. Froeblich
Reg. No. 38,887
551 Fifth Avenue, Suite 1210
New York, New York 10176
(212) 687-2770

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